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ABSTRACT

Applying industrial organizational theory to classroom management, the authors examined the organization of a complex bilingual curriculum for the effects of shared authority among students and teachers and the effects of shared decision-making among staff. Using a math-science curriculum called "Finding Out: Descubrimiento," the nine bilingual classrooms, grades two through four, participating in the study tested two hypotheses: (1) the outcome of a complex curriculum will be improved by delegation of authority to students, communication among students, and supportive supervision by teachers; and (2) reciprocal interdependence and reflective decision-making among teachers and aides will improve the use of a complex curriculum. By scoring the rates of selected behaviors of teachers, classrooms, and individual students, the study confirmed the first hypothesis by finding a strong correlation between the delegation of authority to students and the engagement of students in the curriculum. To test the second hypothesis, the nine teaching teams were divided into a control group and groups holding team meetings, in which behaviors were scored for types of interaction and content. The results, though statistically weak, confirm that children taught by staff with training in shared decision-making are generally more engaged in classroom work than other students. (JW)

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INTERDEPENDENCE AND MANAGEMENT IN BILINGUAL CLASSROOMS

Final Report

Contract Number NIE-G-81-0118

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Interdependence and Management in Bilingual Classrooms
Final Report, NIE ID # 0-0411; 1981-1982

Introduction

This is a the final report on a secondary analysis of a large body of data collected on nine bilingual classrooms as they experienced a special curriculum designed to teach thinking skills in math and science, Finding Out/Descrubrimiento. Data were collected on teaching team meetings, on teachers and aides as they taught the curriculum, on classrooms and individual children as they worked on the curriculum and on learning outcomes as measured by various tests. Previous analyses of these data have documented the learning outcomes and the relationship between the type of implementation of the curriculum in particular classrooms and the learning outcomes of children (De Avila, 1981; Cohen & Intili, 1981).

The purpose of this particular secondary analysis is three fold: (1) to test the hypothesis that strategies of coordination and control involving delegation of authority to the individual learner will lead to a more thorough implementation of this complex curriculum than routine bureaucratic supervision; (2) to evaluate the effectiveness of an organizational treatment in which we attempted to increase reciprocal interdependence and reflective decision making in teams of teachers and their aides ; and (3) to test the hypothesis that reciprocal interdependence and reflective decision making in team meetings will be associated with better implementation of the curriculum.

These analyses all illustrate the way theories of organizational sociology can be applied to the classroom level. Organizational theory is used to derive hypotheses about the relationship between management strategy in the classroom and implementation and learning outcomes. Theory is also used to explain the relationship between the way the teacher and aide work together and successful implmentation of the curriculum.

Design of the Study

The study was designed to answer the questions: Under what organizational conditions will this complex curriculum be implemented effectively? Nine bilingual classrooms, grades two through four, participated in the project; there were 307 children and nine teacher-aide teams. The schools were located in five districts in the San Jose area. Access to these schols and teachers was gained through the Bilingual Consortium of San Jose; all classrooms belonged to the Consortium . Teachers were volunteers from the staffs of the consortium schools.

Only teacher-aide teams where the aide was allowed to work in the instructional area were recruited. It was assumed that this curriculum required, at minimum, a pair of adults who could work interdependently. An additional requirement was that teachers have some experience with learning centers. All the teams experienced a three day workshop, training them in the use of the curriculum activities and in the recommended classroom management techniques. This took place just before the start of the 1979 school year; the program, designed for fourteen weeks, was begun by classes in October, and continued through April and May. There was one follow-up workshop in mid-year.

For five of the nine teams there were two additional workshops designed to teach the teams how to have effective team meetings where they could work together on problems arising from the curriculum. In addition they were taught how to make decisions about their class in a reflective manner, after consideration

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of different kinds of data, and following up the decision with future evaluation of the outcomes. This was referred to as the Intensive Condition. The other four teams were in the Economic Condition. The Economic Condition was so called because it represented the implementation of the curriculum with an absolute minimum cost and preparation of the teachers. Aside from the workshops, a telephone number was provided where teachers could reach someone to answer questions concerning the curriculum. Beyond these measures, teachers were left on their own to implement the curriculum.

In order to assess learning outcomes, tests were administered before and after the curriculum. Some of the test measures were compared to those of comparable bilingual classes within the Bilingual Consortium. In order to assess processes, detailed and systematic observations were taken of the nine classrooms, of the teachers, and of a selected set of target children. Tape recordings were made of the teacher and aide team meetings for those teams receiving the extra workshops (The Intensive Condition).

The Curriculum: Finding Out/ Descubrimiento (FO/D)

The goal of this curriculum is conceptual learning in the areas of math and science. The activities consist of a series of learning centers each featuring a math/science task stressing thinking skills. FO/D provides a wide range of experiences using interviewing, formulating and testing hypotheses, analyzing results, and forming conclusions. Repetition of the key concepts is accomplished in a number of different forms across activities. The concept of number, for example, is found in at least 12 different activities in different learning modes and topics, and is used indirectly in many more centers.

The curriculum is derived from a developmental framework (Kohlberg & Mayer, 1972); the focus is on concept formation in contrast to rote learning. "Basic skills" are placed within a meaningful context from the child's point of view. The activities were selected on the basis of laboratory studies, existing programs, and direct experience; only tasks that were known to be within the grasp of children on different developmental levels were chosen. In other words, tasks were constructed so that the least and most gifted would be able to gain something from them.

Tasks are intrinsically interesting; they include activities that require the use and development of basic skills. Careful pretesting of materials also sought activities that did not require a middle class set of experiences to understand them. Instructions at each learning center were in Spanish, English and pictographs; the teachers were bilingual. Thus activities were accessible to all students, regardless of proficiency in either language.

Activities were designed for use an hour a day, four days a week, for 14 weeks. All students were to complete each learning center as well as worksheets that accompanied each activity. There were multiple learning centers in operation in the classroom at any one time. Students were free to choose which center they wanted to work at, but they were required to keep track of centers completed and to complete one activity before moving on to the next. Typically, students worked in a variety of grouping patterns. Some worked by themselves; others worked in small collaborative groups while talking about their work, or in parallel fashion as they manipulated materials. Two classroom rules governed interaction: "You have the right to ask anyone at your learning center for assistance." "You have the duty to assist anyone who asks for help."

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It should be made explicit that such an environment was not designed as a student free-for-all. On the contrary, the activities provided a rigorous structure. A child who was functionally illiterate was obliged to fill out worksheets requiring reading, writing and computation. The child was allowed to use classmates as resources in getting this task done, but was not excused from the task on the basis of achievement or ability.

The teacher's role as this program was actually implemented varied somewhat between classrooms, but, on the whole, both teacher and aide were busy moving about the room assisting the children to complete their work and checking worksheets. They were also found giving orientation to the whole class on new learning centers. Some teachers tended to cut down the number of centers in operation so that they and their aide could supervise more directly, while others followed instructions to delegate more authority to children to work together while keeping six or more centers in simultaneous operation (See Cohen & Intili, 1981, for a study of implementation of this curriculum.). The teacher was freed from the task of deciding how to adjust the activity for individual differences because children could work at the tasks on their own developmental level.

Sample

Nine classrooms participated in this study; they were all receiving bilingual education instruction under a U.S. Title VII grant awarded to the San Jose Bilingual Education Consortium. The Consortium was composed of nine cooperating school districts in the greater San Jose, California area. The program offered by the Consortium included the provision of teacher aides, special workshops for teachers, strong emphasis on reading and math classes and considerable testing of the attainment of teaching objectives. Much of the regular program reflects a traditional model of compensatory education. The nine teacher and aide teams were recruited both through oral presentation and a recruitment survey.

There were approximately 370 students in these nine classrooms; they were mostly third and fourth graders with a small percentage of second graders. All the students from each class were involved in the curriculum. Students were largely from Hispanic backgrounds with a small proportion of Anglos, Blacks and Asians. Their family backgrounds were mostly working class and lower white collar; some of the children were from families on welfare.

Overview of Learning Outcomes and Engagement

Evaluation of learning outcomes for the nine classrooms revealed highly significant gains in total scores of CTBS, Math and Reading, as well as significant gains in a content referenced science test and a measure of English language proficiency (Language Assessment Scales developed by De Avila). The gains exhibited by the curriculum group on CTBS Math were greater than the rate of acceleration predicted for the majority population on the state testing norms. The nine classrooms were compared on the gains from fall to spring for CTBS with comparable classrooms also working with the bilingual Consortium. Gains relative to the state norms were greater for the curriculum classrooms than for the controls; the treatment group gained on the state norm, while the control groups maintained their position below the state norms (Wilson, De Avila, & Intili, 1982).

The observed level of time on task was very high during the curriculum. Analysis of off-task behavior showed that fully 19% of the sub-sample of children observed intensively were never seen disengaged in all the weeks of observation

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of FO/D. Only 6% were disengaged, on the average, for more than a third of the time. Disengagement was a significant negative predictor of learning outcomes on CTBS, holding constant pre-test scores on the tests (Cohen & Intili, 1981).

The level of implementation varied among the nine classrooms; some classrooms allowed for the simultaneous operation of more learning centers than others. Accompanying this difference was a differential rate of children talking and working together. When the teacher had more learning centers in operation, there was more of an opportunity for children to work together without direct supervision by an adult (Cohen & Intili, 1981). Moreover, the observed rate of talking and working together was a positive predictor of learning on the content-referenced science test. The frequency with which we saw the children reading and writing on their worksheets was a strong predictor of gains on the science test and on the CTBS Math and Reading Test. In addition to teaching the concepts, reading the activity cards and writing on the worksheets evidently reinforced and improved basic skills, as measured by CTBS.

THEORETICAL FRAMEWORK

Overview

This secondary analysis tests the relationship of management to implementation and to outcomes from a complex curriculum. The basis for these analyses is a theoretical analysis of classroom organization and process that views curriculum as an instance of technology and then examines the demands that the technology poses both for relations among workers and for the relationship between workers and supervisors. (The students are seen as the workers and the teachers as the supervisors.)

The theory allows us to understand the conditions under which a complex curriculum may be successfully implemented and translated into improved learning outcomes. In a sense we are performing an evaluation of classroom or teacher effectiveness. It differs from other approaches in that we are examining the process whereby input is transformed into output, rather than predicting outcomes solely on the basis of the important inputs into the system (such as finance, student quality or teacher quality). The major concepts are briefly defined below; we describe the theory and research underlying the particular propositions tested in this analysis.

Curriculum as Technology

To sociologists the concept of technology does not necessarily imply use of machines. Rather it is a conception of a task as a series of means-end sequences (cf. Waldo, 1969). Sociologists working at Stanford University in the Environment for Teaching program, developed an application of the concept, technology, to classroom instruction. The two major dimensions that have been found useful for analysis are: degree of differentiation and routinization of decision making. Classes are seen as more complex in their technology to the extent that their activities are more differentiated and their implementation requires non-routine decision making.

In this view, the traditional method of teaching where the class is assigned a task as a whole or sits as a group, listening to the teacher talk, is similar to large-batch processing in industry. The task is standardized; every student is given the same amount of time for completing work and is routinely evaluated on how well he or she carries out the task in the prescribed manner and attains

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the desired outcomes. Instruction of this type shows a low degree of differentiation.

In contrast, many of the elementary school classrooms studied by the Environment for Teaching had multiple materials and groups in simultaneous usage. When the method of instruction utilizes multiple materials, activities and grouping patterns simultaneously, the technology is said to be differentiated. The introduction of individualization techniques to the teaching of basic skills for elementary school produced rapid growth in differentiation of the technology of teaching (see Cohen, Deal, Meyer & Scott, 1979, for a description of this trend).

Finding Out/Descubrimiento represents a highly differentiated technology. At any one time there are up to 12 learning centers in a classroom. Each learning center features an entirely different activity involving its own set of manipulable materials, and worksheets. The instructions are available at each learning center in English, Spanish and in pictographs. Children are in a variety of grouping patterns. Some are working by themselves; others are working together on worksheets or manipulating materials together or talking over what they are to do at the learning center. These groups may range from two through five children.

The second dimension of technology, routinization of decision making, refers to the way in which the workers in charge of the operation make decisions about how the work will be done. If a task has been standardized or if work is governed by a set of traditions as to "how things should be done," then decision-making is more routine. In the third grade, for example, tradition dictates that everyone should take up the study of fractions. Examples of non-routine decision-making in modern teaching methods are individualized instruction requiring the teacher to diagnose and prescribe for the needs of individual learners or open classrooms where children are allowed to make many of the decisions for themselves.

In some ways the instructional decision-making in FO/D is routinized. Each child is presented with the same instructions and carefully prepared materials at a given learning center. Furthermore, each child is supposed to complete tasks at each center and fill out the same worksheet. The tasks are designed so that children who vary in level of cognitive development will work the task somewhat differently. No task is set up so that children who are at a lower level of development are prevented from completing the activity. This design feature saves the teacher making decisions as to how to adjust the character of the task for individual differences.

However, there remain individual differences the teacher must take into account in running this curriculum. For example, there are many non-readers; some provision must be made for their understanding the instructions. Furthermore, some children require much more guidance than others in finding their way through a novel set of instructions. Some children will require more time and attention in feedback on their worksheets. From the curriculum developer's point of view an important role for the teacher is to extend the depth and cognitive level of the child's inquiry. Some students who may be developmentally capable of dealing with the problem on an advanced or more abstract level, will need to be encouraged to do so by the teacher asking critical questions. Thus if this curriculum is to be properly implemented teachers must still observe individuals and make non-routine decisions about attention and treatment individual students should receive.

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Classroom Management

Classroom management here is seen in relation to the authority structure of a formal organization. The teacher is viewed as a supervisor who has important control rights over students and who also has to coordinate activities in the sense of allocating time and space to persons and resources in connection with the work process. We therefore speak of coordination and control of the curriculum rather than the more general term of "management".

A complex technology such as this curriculum, highly differentiated and requiring non-routine decision-making has some implications for the authority and managerial system of the classroom. If the staff uses traditional methods of control, i.e., routine bureaucratic supervision, some students will not get enough help to understand what they are supposed to be doing. Other students will move through the curriculum in a mechanical fashion, without real understanding of the concepts; there will be tremendous bottlenecks with children waiting for adult attention and direction. Clearly, attempting to run this classroom with direct supervision of large groups of children would result in a decreased effectiveness of the curriculum for many learners.

Now suppose the teachers were to increase the amount of communication to individuals in order to reduce the amount of task uncertainty students face in solving the problem at each learning center. This is the method of coordination and control found in many classrooms using individualized instruction. With a curriculum of this complexity it turns out to be impossible for the teacher and aide to solve all the problems faced by students with direct communication. The adults cannot be everywhere at once, explaining instructions, solving problems with handling the materials, and filling out worksheets. Furthermore, if they try to do this, they will have no time to give feedback on student work or to extend activities. Instead, it becomes absolutely critical to delegate some authority to the learners themselves. It is essential for students to help each other with instructions, with the equipment, with grasp of the concepts, and with filling out the worksheets.

The connection we have just described between the curriculum and shifts in the teachers' role can be inferred from a general proposition of organizational sociology: As technology becomes more complex, methods of coordination and control must shift from that of routine bureaucratic supervision and coordination by rules and schedules (Thompson, 1967). Contingency theory and research state that as task uncertainty increases, coordination and control are marked by increased communication; mutual adjustment; use of horizontal channels; and extensive use of supportive feedback and supervision (March & Simon, 1958; Ritchie, J.B., 1976; and Van de Ven, A.H., et al., 1976).

In other words, as technology grows in complexity, there is a shift from direct authority to delegated authority. Furthermore, there is an increase in the use of lateral relations as channels for communication. If the coordination and control system does not shift to "match" the technology, then productivity declines and there is a loss of organizational effectiveness (Perrow, 1961). This proposition taken from Perrow is of central importance to the derivation of the first hypothesis:

> Given a curriculum of this complex character, the traditional classroom organization of students working as individuals under direct supervision of an adult will not be as effective as a classroom

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organization marked by delegation of authority to the learners. Effectiveness in our case is defined in terms of the thorough implementation of the curriculum and in terms of the learning gains of students on the curriculum.

As the theorists have argued, it is necessary to substitute horizontal communication and mutual adjustment for hierarchical authority. If there is to be a suitable coordination and control system in these classrooms, the learner must have the authority to solve problems by using instructions and materials in his own way and by using classmates as resources in obtaining necessary information and feedback in completing the activities. Furthermore the necessary horizontal communication takes place in small groups of students working together as teachers and colleagues of each other.

Finally, the teacher's role must shift from that of routine supervisor. Having delegated some authority for direction and facilitation of the task to the learners themselves, she is then free to attend to the supportive supervision which Ritchie states is so important when tasks are non-routine and uncertain (1976). In the case of this curriculum, supportive supervision means giving feedback to individuals on their worksheets, asking them questions, and extending activities of groups and individuals. Although the teacher has delegated authority she has by no means given up control of the teaching situation; this critical function is maintained by evaluating the outcomes of student efforts on their worksheets.

In review, we use contingency theory to infer that the nature of this complex curriculum should shift control and coordination from routine bureaucratic supervision to (1) delegation of authority to learners, (2) strong lateral relations between students, and (3) use of teacher's authority in a supportive role, providing feedback to the learners. From Perrow's proposition concerning the match between coordination and control to technology, we derive the following prediction:

> Given a curriculum marked by great task uncertainty for the learner, implementation and learning outcomes will be more consistent and favorable in a class with strong delegation of authority to the student; frequent lateral relations between students; and supportive supervision by the teacher.

Work Arrangements and Effective Implementation of a Complex Technology

What are the optimal staff arrangements for implementation of such a complex curriculum? From the staff's point of view, the task is also one of great uncertainty with a maximum need for processing information about how individuals and groups are functioning.

In their classic work, March & Simon theorized that more highly complex tasks are better accomplished by staffing patterns of high interdependence (1958). This proposition has received empirical support in classroom studies. The EFT program has documented the connection between differentiation in reading materials and teaming of teachers as an example of increased interdependence (Cohen, Deal, Meyer & Scott, 1979). When teaching takes on a high degree of differentiation and non-routine decision-making, teacher teams and teacher-aide teams are much more likely to exhibit what Thompson calls "reciprocal interdependence" (Intili, 1977; Robbins, 1977).

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Not only is FO/D highly differentiated, but, if implemented properly, it also presents non-routine decision making for the staff. These decisions include trouble-shooting. If learning centers are not set up in proper physical arrangements, the children will experience difficulties in carrying out their tasks. The learning centers themselves vary as to how much orientation they require, the necessity for direct supervision because of physical dangers, and the adequacy of the written instructions. Finally, technical problems and problems of coordination of materials and facilities can lead to students wandering around the classroom or spending large amounts of time waiting for an adult.

It should be pointed out that these are problems which cannot be solved by delegation of authority or relations between students. These are system-wide problems and problems requiring some special administrative expertise and decision making.

To solve these problems, organizational sociologists would recommend that teacher and aide be reciprocally interdependent. In practical terms this means that they should gather information on problems, discuss them, decide on trial solutions and evaluate those solutions over time. Otherwise, they will be limited to dealing on an individual instead of a system-wide basis.

Reflective Decision Making

Reflective Decision Making (RDM) is a term coined by Intili (1977) to represent a technique of teacher decision-making covertly and overtly recommended by educational philosophers, curriculum developers, and administrators. It focusses on three elements: the breadth of topics considered by a teacher, the thoroughness with which a topic is followed up and the extent to which a teacher evaluates the successes and failures of decisions made. Breadth of decision making is a wide-lens focus on classroom issues, i.e. inclusion of a wide variety of different aspects of classroom process into decision-making (example: students' interests, needs and strengths, the physical set-up of teaching tasks, coordination and control mechanisms used). In her dissertation, Intili found that teachers generally focussed on a wide variety of topics in their decision making.

Thoroughness is the extent to which teachers follow through on any of the issues. For example, if they discuss student skills, do they focus upon it in decisions about grouping, worksheet performance, ability to handle a given task, management problems, or other areas? In Intili's dissertation, a more thorough approach was less likely to occur than a broader approach. It seemed as if most teachers sampled (N=250) discussed a number of different topics, but each topic was discussed in only one area of classroom process.

Evaluation in RDM is the cyclical concept that interjects the results of relevant past decisions into the present discussion. In the earlier Intili study, only one-fifth of all the teachers sampled could have been said to do this.

Teachers and aides do not generally think either in terms of systems or reflectively about the effectiveness of their classroom decision making. While many of the methods of individualization require teachers to be systematic in their approach to students' needs, studies by Shavelson (1981), Clark & Peterson (1976), and Intili (1977) strongly question these assumptions. Shavelson, for example, questions the expectations that teachers will treat students individually, or will make decisions in terms of individual students. Unless an attention grabbing action takes place, Shavelson seems to find that teachers make decisions in a way which groups together the largest possible number of stu-

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dents. Clark & Peterson note that teachers plans seem to be one thing and their actions another. If asked why they made a certain decision, the teachers often cannot remember, even when prompted by a videotape of the action. Intili too finds that while teachers focus on a broad range of issues in their classroom process, they tend not to follow up on their decisions, and they are even less likely to evaluate and revise their decisions. Teachers and aides face four problems which militate against a pre-active, systematic and reflective approach to classroom decision making:

1. lack of time to plan for classroom instruction compounded by the saliency of immediate class events.

2. lack of support for classroom planning and systematic evaluation of their process--either from the school organization or from pre-service training in these areas.

3. information overload and task overload which make teachers want to reduce their burden rather than increase it by systematic discussion and consideration of alternative courses of action.

4. practices which keep decisions unclear and unnoted (This ambiguity greatly complicates the practice of evaluation.)

Treatment of Teams

It was the knowledge of the problems teaching teams experience in working together that impelled us to include in the original research design an attempt to improve the meetings of the team, so that they would be better able to handle the uncertainties of the curriculum. Thus the design called for a special treatment of five of the teams, deliberately calculated to increase their reciprocal interdependence and to teach them how to carry out reflective decision-making.

Previous research had shown that if the instruction became more highly differentiated over time, teachers became more interdependent (Cohen, Deal, Meyer & Scott, 1979). Intili's work had demonstrated an association between teaching that was both highly differentiated and required non-routine decision making with reciprocal interdependence of teacher and aide or a team of teachers. In this design, we attempted to increase the reciprocal interdependence of the team to see if this would enable them to handle the uncertainty of such a complex curriculum and whether it would lead to improved implementation of that curriculum.

The idea was to create a situation where teachers and aides could become problem-solvers and reflective decision makers for each other (as well as for the students). We trained teachers and aides to divide up the labor in different ways; we paid them to hold regular meetings where planning and systematic evaluation of their process was the focus; we taught them to use a variety of sources of information; we made special efforts to encourage the aide to play an important role in the team, namely to make suggestions and bring in information (though it was the responsibility of the teacher to make final decisions); and finally we taught them how to keep track of the decisions they made more easily.

Success of our treatment, we felt, could be shown to the extent teachers and aides actually did play the interdependent roles we advised and gave evidence of

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reflective decision making. Evidence of reflective decision-making would be that teams:

1. did set relevant agendas and plan for instruction;
2. did systematically examine classroom process;
3. did think reflectively about their class process; and
4. did make decisions in a way where the decision was clear and its implications for future action were also clearly delineated.

Review of Hypotheses

In review, these secondary analyses test two general propositions based on organizational sociology. The first general proposition focuses upon optimal strategies for coordination and control of the classroom for successful implementation of a complex curriculum. Organizational theory stipulates that for complex tasks, increased delegation of authority, increased communication between workers and increased communication between workers and supervisors are necessary to obtain positive outcomes.
In this body of data we test the following proposition:

> Given this complex and sophisticated curriculum, more effective implementation and better learning outcomes will be positively associated with delegation of authority to students, lateral relations between students, and supportive supervision by the teacher.

The second proposition focusses upon the relationship between staff members and successful implementation of the curriculum. It is argued that increasing reciprocal interdependence of the team and improving their skills in reflective decision making will result in their ability to master the uncertainties of managing complex classrooms involving non-routine decision making. This proposition has similar roots in organizational sociology to the first, i.e., work arrangements marked by reciprocal interdependence are more effective in handling task uncertainty and non-routine decision making than work arrangements involving less communication and more rigid division of labor. Within the limits of a very small sample we examine the evidence for the following proposition:

> Reciprocal interdependence and reflective decision making in the team meetings will be associated with better implementation of a complex curriculum.

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PROPOSITION I: STRATEGIES OF COORDINATION AND CONTROL

Construction of the Coordination and Control Indices

The first step in testing the hypothesis on coordination and control was the empirical description of strategies used by the nine teachers. There were a number of variables relevant to these concepts in the data bank. These included information on the extent to which the teacher delegated authority to individual students, the extent to which she used lateral relations between the students, and the amount of supportive supervision she used. Most of these variables were drawn from two instruments: The Teacher Observation Instrument and the Whole Class Observation Instrument. In addition, there was one important variable available from the Target Child Instrument. These instruments have been described in detail elsewhere along with their reliabilities (Cohen & Intili, 1981). Here we will briefly describe the instruments and specify the particular variables used for the analysis.

Teacher Observation Instrument

This instrument scored the teacher's behavior for 15 minutes during each classroom visit to observe the implementation of the curriculum. The teacher was scored for the number and content of individual communications to students. Variables relevant to this analysis are listed below:

1. Teacher facilitates the completion of a FO/D task or worksheet.
2. Teacher asks student substantive questions.
3. Teacher gives feedback to student on previous worksheets, on current activity, on general progress or on how well the student is working with others.
4. Teacher talks to student about interests, skills, or feelings.
5. The number of different individuals in the class the teacher talked to during the observation period.

To calculate a rate of behavior, the frequency of a particular behavior scored over all observations for a particular teacher was divided by the number of minutes that teacher was observed. This yielded a rate per minute of particular behaviors. In the case of observed teacher behavior, we always required that an analysis of variance of frequencies for each observation show that there was a significant effect of <u>teacher</u> before we used that variable to describe a teacher. This was done to assure ourselves that we had a sufficiently stable set of observations on a particular variable so that it would be fair to characterize individual teachers with that statistic. In some cases we combined a number of variables in order to create a descriptive statistic which met this requirement of reliability.

The number of different individuals the teacher talked to was used to calculate a percentage of all individuals present in the classroom for that observation and was averaged across all observations for a given teacher.

Whole Class Observation Instrument

Twice during each classroom visit, the observer used a scoring grid representing the grouping pattern and activity of each child in the classroom This form also recorded the number of children wandering, disengaged, or moving about the

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classroom on business. The particular variables we used for measuring coordination and control from this instrument were as follows:

1. % of students in Groups of Size 2-6
2. % of Students Working Alone
3. % of Students Under Direct Adult Supervision
4. % of Students in Transition on Business

Target Student Observation

In addition to observations of the teacher and the classroom as a whole, there were approximately 100 children on whom we collected three minute observations. One set of target children was selected to represent various levels of English and Spanish proficiency. Another set was selected by their teachers as "problematic" in the areas of math and science.

Observers visited classrooms once a week during operation of the curriculum to score the behavior of each target child for three minutes; children were observed in randomized order during each visit. The observer began the scoring period for each child by recording the nature of the activity and grouping pattern in which the child was operating. If the child were found reading or writing during the three minute observation period, the observer checked this off on the coverpage. For each 30 second interval of a three minute period the observer would record the frequency of task-related talk, and the frequency of selected non-verbal behaviors: working alone or together on the curriculum, and off-task behavior. In addition to scoring talk, the observer recorded whether the target of the talk was peer or adult. When the teacher or aide talked to the target child during the observation period, it was scored and classified as to whether it was instruction or behavior management.

The variable of interest here was the rate at which target children in a particular classroom offered assistance to peers. This was a measure of the delegation of authority to individual learners as well as a measure of lateral relations.

Intercorrelation of Variables

We had originally expected to find three clear patterns, with teachers doing one or another of the three patterns as a typical mode of operating. The three patterns originally expected were Routine Bureaucratic Supervision marked by the use of large groups under direct supervision of an adult and directives concerning discipline and behavior from the teacher. The second contrasting pattern was a delegation of authority to strong lateral relations with supportive supervision. This was to be marked by frequent use of small groups, frequent use of teacher feedback, supportive talk to individual students, and asking of questions. In between these two extremes, we predicted a pattern of "Partial Delegation of Authority." In this pattern we expected to find a teacher who facilitated individuals as opposed to groups. These teachers were expected to talk to a large percentage of their students. In their classes we expected to find a large percentage of students working alone.

Study of the intercorrelation of the variables revealed that only one of these three patterns : Routine Bureaucratic Supervision--held together exactly as we expected. Much to our surprise, we found that the percentage of children working alone was <u>positively associated</u> with the percentage working in small groups (r = .45). Furthermore, the tendency of the teacher to facilitate indi-

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vidual performance was also positively associated with the percentage working in groups (r = .3[illegible]). The only two variables that were unrelated or negatively related to this cluster were the percentage of individuals talked to and the rate of teacher feedback.

These results caused us to rename two of the three strategies more accurately. The strategies and their component variables are described below.

Delegation of Authority to Individuals with Lateral Relations Permitted. We renamed the first strategy so as to reflect the fact that we found no teacher who made strong delegation of authority to groups. It is more accurate to describe the pattern of delegation as one to individual learners who were held responsible for their own learning and who were permitted to use each other as resources. This is not the same as giving a collective task to a group where the evaluation of the product is dependent on group performance. It will be recalled that each child was responsible for his/her own worksheet and for finishing each learning center. S/he moved between centers as an individual. However there were classroom rules that made it legitimate to ask for assistance and an obligation to give assistance when requested.

In classrooms where the teacher had successfully delegated responsibility to the student, as described above, we would expect to see children actively engaged in tasks, sometimes collectively and sometimes by themselves, offering assistance to one another, or moving about the room "on business." This pattern would suggest that the teacher had given the class an adequate orientation to the learning centers so that students were able to work independently, using each other as resources when necessary. The teacher is moving about the room facilitating individuals who need extra assistance. The specific variables comprising this strategy of coordination and control are:

1. percentage of students working in small groups
2. average rate of students' offering assistance to one another
3. percentage of students working alone
4. average rate of teacher facilitation per observation
5. average rate of teacher questions per observation
6. percentage of students in transition on business.

Table 1 gives the interrelationship of these variables for the nine classrooms. The matrix shows a generally positive level of intercorrelation. With such a small N only three of the correlations reach the .05 level of significance. The Cronbach alpha reliability coefficient for this scale is .76.

TABLE 1 HERE

Working with Individuals. When we examined the interrelationship among all the various management indicators, two variables stood out--closely related to each other and unrelated or negatively related to the others-- percentage of students talked with per observation and average rate of teacher feedback. These variables comprised our second index, a pattern of control where the teacher is more active in directing the students' activities. This strategy, referred to as Working with Individuals, should be less effective than delegating more responsibility to students for their own learning. The quality of the teacher's interactions will be limited by the sheer number of students she is trying to deal with on a one-to-one basis.

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The feedback variable was originally conceptualized as a highly supportive kind of supervision. As it turned out, no teachers gave students support with any frequency on anything but their current activity. They all seemed to be so busy facilitating the completion of complex activities and the filling out of worksheets that they evidently had little time (or insufficient training) to talk to individuals with any depth. Feedback on current activity occured on the average of 1.93 times per minute and did not yield a stable estimate of individual teacher behavior. To create a reliable measure of feedback we combined all the feedback variables and all the variables on the frequency of talk to students about their interests, skills and feelings into an overall feedback measure. This statistic did yield a significant teacher effect for its inclusion in an index of coordination and control. However, it should be remembered that the only behavior that occurred with any frequency was feedback on current activity. Table 2 presents the average rate of occurrence for the variables that make up the measure of overall feedback.

TABLE 2 HERE

The two components of this strategy, percentage of students talked to and the rate of teacher feedback were correlated significantly---$r = .54$; $p < .05$.

Routine Bureaucratic Supervision. A third pattern of control, called Routine Bureaucratic Supervision, involves the direct supervision of students in a "large-batch processing" mode. The variables in this pattern are percentage of students under direct supervision and rate of teacher discipline per observation. The percentage of students under direct supervision was obtained by counting up the number of students on the Whole Class Observation Instrument who were with an adult. This was indicated on the instrument by marking the location of the teacher and other supervising adult and placing all those students under direct supervision in a parenthesis. The correlation of this variable with the rate of discipline was .61($p < .05$).

Profiles of the Nine Classes

In order to obtain an overall picture of how each classroom stood on each of the three strategies, we combined the relevant variables into one index measuring each strategy. This was done by standardizing variables with z scores before combining them into an overall index. Once this had been done, we could compare how each classroom stood on all three strategies.

Figure I is a histogram representing the standardized index score for each teacher on each of the three strategies. The vertical axis represents the index score. Because of the use of z scores, a zero score represents an approximate midpoint with many of the total index scores having a negative value. Those schools with an asterisk beside them represent the teams that experienced the two intensive workshops.

FIGURE I

The first thing to note is the wide variation of the index score measuring delegation of authority to individuals with lateral relations permitted. Classes 5,7, and 9 are the only three with a score above the zero point. Classes 3 and 4 and especially Class 8 show low levels of this strategy. Classroom 9 is particu-

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larly interesting; not only does this team have the highest score on Delegation of Authority, but it has the highest score on Works with Individuals and the next to highest score on Routine Bureaucratic Supervision. This team, as we shall see, has the highest all-around scores of implementation and learning gains; and the team appears to be utilizing all three strategies at different times of observation. This particular team made frequent use of whole class treatments for the purposes of orientation to new learning centers and for wrap-up sessions discussing what the children had learned. This was the only classroom to make such extensive use of wrap-up sessions.

There is considerable variablity between classrooms in the other two patterns as well. Furthermore, there are many combinations of these patterns. For example, Classes 1 and 8 use much more routine bureaucratic supervision than they use delegation of authority while classes 5,6, 7 and 9 represent the reverse pattern. Some classses do not appear to have high scores on any of the strategies (Classes 3 and 4). Those who work extensively with individuals may or may not delegate authority or use routine bureaucratic supervision.

Intercorrelation of the three indices revealed that Delegation of Authority to Individuals was strongly negatively related to Routine Bureaucratic Supervision ($r = -.74$; $p < .01$). However there was no relationship between Working with Individuals and Delegation of Authority to Individuals. These intercorrelations are given in Table 3.

TABLE 3 HERE

Relationship of Implementation and Learning to Strategies Used

The first hypothesis predicted that Delegation of Authority would be associated with more effective implementation and learning gains than Routine Bureaucratic Supervision. Keeping in mind that the index of delegation turned out to be delegation of responsibility to individuals with lateral relations permitted rather than to groups, we are now ready to turn to an examination of the relationship of the scores on coordination and control to classroom scores on implementation and to individual measures of learning.

Imnplementation Measures

Previous analyses of the data on implementation and learning allowed us to select the most important indices of implementation. These variables and their sources in the data bank are listed below:

1. percentage of students reading or writing (Whole Class Observation)
2. percentage of students talking (Whole Class Observation)
3. Number of Learning Centers in use (Whole Class Observation)
4. Average number of worksheets completed per student (count of worksheets collected and turned back to researchers by the teacher).

For each variable based on Whole Class Observation, an average was struck for all observations made. In the previous analyses each of these variables had significant relationships to different kinds of learning measures (See Cohen & Intili, 1981)).

Strategies and Effective Implementation

Table 4 gives the correlations of the three strategies with each of these variables and with an overall Index of Implementation. This overall index is created by standardizing each of the four component variables listed above and

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adding them together to form an overall index. Also presented in this table is the correlation of the strategies with the average percentage of children found to be disengaged during the Whole Class Observation. This was, on the average, a very small number because overall engagement levels were unusually high. However, there was some variability between classrooms. Furthermore, disengagement had been found to be a negative predictor of learning outcomes on the basis of individual observations (Cohen, 1982).

TABLE 4 HERE

Considering an N of 9, there are some very strong relationships shown in Table 4. Furthermore these relationships are supportive of the hypothesis. All the correlations between Delegation of Authority to Individuals and the measures of implementation are positive. The strongest relationship is that of this strategy to the overall implementation index ($r = .84$; $p < .01$). The strongest relationship of a component variable to the strategy is that between delegation and the average number of learning centers in use ($r = .70$; $p < .05$). Delegation of Authority turns out to have no relationship with the average percentage of students disengaged.

As predicted, Routine Bureaucratic Supervision had negative relationships with all but one of the separate measures of implementation. It bore no relationship to the average number of worksheets completed. (Class # 1 had by far the highest number of worksheets completed but this class also made frequent use of Routine Bureaucratic Supervision.) The relationship between Routine Bureaucratic Supervision and the overall index of implementation was $-.61$ ($p < .05$). Again, this strategy had no relationship to the percentage dissengaged.

The strategy called "Works with Individuals" turned out to have a negligble relationship to all the implementation variables with the exception of the percentage of students talking. Here the relationship was a statistically significant negative one ($r = -.57$; $p < .05$). There was a negative relationship between Works with Individuals and average percentage disengaged although it did not quite reach the .05 level of significance ($r = - .49$).

Strategies and Learning Gains

In order to examine the relationship between the use of these strategies and learning, we calculated correlations between the strategies and the indiviudal post-test scores on several test measures, while partialing out the effects of the pre-test scores. The learning measures examined included the CTBS Math test broken down by sub-tests, a total test score for CTBS Reading and the score on a content-referenced test, especially constructed for this curriculum. Previous analysis of learning gains had shown relationships between the implementation measures and CTBS Math (particularly strong with the Math Applications Subscale), with CTBS Read and with the content-referenced test.

Table 5 gives the partial correlations of the strategies with the post-test scores. In this table we can use the larger N of students on whom we have the relevant pre and post-test scores. Each student is assigned, as a contextual variable, the score on the strategy of coordination and control used in their classroom. With this larger N it is of course much easier to obtain a level of statistical significance in the partial correlations.

Delegation to Individuals has a statistically significant relationship to the following measures of learning: Total CTBS Math, Application Math Subscale,

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Concepts Subscale and the content-referenced test. This means that learning gains on a number of measures were associated with experiencing the curriculum in a classroomn where the team delegated responsbility to individuals with lateral relations permitted. Routine Bureaucratic Supervision was significantly negatively related to learning gains on the CTBS Math, as a whole and for each of the three subscales. Working with Individuals was negativ.ly related to learning gains on the CTBS Math score and on the computational subscale.

TABLE 5 HERE

The positive relationship of the delegation of authority to these learning measures supports the hypothesis as do the negative relationships seen for Routine Bureaucratic Superivision. Working with Individuals, for which no initial prediction was made, turned out to be unrelated to learning gains or negatively related.

Discussion of the Strategies

It was not until we began to examine the intercorrelation of the variables we had expected to make up the pattern of Delegation of Authority, that we fully realized the implications of the way we had advised teachers to structure the classrooms. The preceding year's analysis of implementation and learning had shown us that working and talking together was a powerful predictor of conceptual learning gains. We had therefore assumed that successful teachers were delegating authority to groups. But the intercorrelation of variables belonging to the concept of delegation of authority to groups and the use of supportive supervision revealed that (1) working in groups was **positively related** to working alone and that (2) the teachers weren't doing a great deal of what we considered "supportive supervision." Instead they were providing feedback mainly on current activity; and even a measure combining all kinds of feedback and supportive talk was unrelated to measures of delegation.

This finding forced us to go back and look once more at what we had advised the teachers to do. We then realized that the suggested method of implementation was much more a matter of delegation of authority to individuals rather than to groups. Each child was responsible to complete all learning centers and worksheets. Children were permitted to use each other as resources----they were not directed to use each other as resources. As a result, classroom observations where delegation had taken place showed a mixed pattern of individuals getting the job done on their own, sometimes working with others and sometimes working by themselves.

As a result of this analysis we renamed the delegation strategy as Delegation of Authority to Individuals with Lateral Relations Permitted. The intermediate pattern became Working with Individuals and was measured by the number of different individuals talked to in an observation and the rate of Teacher Feedback. The third strategy had two positively related components as predicted: percentage of children under adult supervision and the rate of teacher discipline. The third strategy was called Routine Bureaucratic Supervision.

The results of correlating these strategies with implementation and learning gains gave much support for the general hypotheses that delegation would be positively asociated both with effective implementation and learning gains. Even if the teachers only delegated to individuals, it was still a significant

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positive predictor of implementation and learning gains. Teachers who did not delegate authority but maintained routine bureaucratic supervision were not able to implement the curriculum as fully and were less able to achieve desirable learning outcomes.

These are important findings because they link the management strategy of the teacher to both implementation and learning, given a complex curriculum of excellent quality. These findings also represent a fruitful application of organizational sociology to the classroom level. Rather than individual characteristics or personal teacher characteristics as predictors of learning, we are finding methods of coordination and control relating to learning outcomes. Furthermore we are using the same distinctions as an industrial sociologist concerned with problems of supervision and its relationship to productivity or measures of organizational effectiveness.

As valuable as it was to find support for the hypotheses, equally valuable were certain unexpected findings that emerged from this analysis.

1. The most effective team, (#9) from the point of view of implementation as well as learning gains, employed a combination of all three strategies. Upon thinking once again about the curriculum and combining it with our detailed clinical knowledge of how each class functioned, this appeared to make a good deal of sense in that this team did not try to run the learning centers with large groups and routine bureaucratic supervision. Instead they used the large groups for careful orientation to learning centers and for wrap up sessions where they discussed the concepts that had been learned. This mixed pattern was quite different from the least effective classroom (#8) where very little delegation of authority occurred and where the common pattern was larger groups working at learning centers while adults directed individual students.

2. The simple measure of time on task in this data bank was a negative measure called "% disengaged." This measure did not show a clear relationship to strategies of coordination and control. Figure II below shows a histogram where overall implementation of each classroom is shown alongside the disengagement measure. One can immediately see a surprising finding: Although the most favorable classroom, Classroom 9, shows a high level of implementation and a low level of disengagement, there are also classrooms that have a low level of both disengagement and implementation as well as classrooms which show a high level of both. The two variables are clearly not well related to each other. One can think of engagement as a necessary but not a sufficient condition for successful implementation. It is important to keep in mind that there were no classrooms where many students were disengaged. All these teachers were reasonably effective disciplinarians (with the possible exception of Teacher #8), given the control techniques they chose to use.

FIGURE II

There was a positive, but insignificant correlation between the strategy of working with individuals and lower levels of disengagement. This suggests that teachers were using the strategy of working with individuals to keep all students engaged. Rosenholtz found in these same data that when teachers facilitated individual students, it tended to happen in the minute after we had noted that student was disengaged (1981).

The overall picture given by these data, even in the most favorable classrooms, is one where the teacher is very busy with the problem of facilitating

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the task for individuals. Facilitation was by far the most frequent behavior. Possibly the teacher was so busy keeping all students engaged, that she had no time for the more subtle type of teaching interaction we had recommended such as varied feedback and extending the children's thinking and activities.

Thinking about this problem brought us to an important conclusion: the best way to help the teacher with finding more time to do higher level teaching with individuals was to suggest a delegation of authority to groups rather than to individuals. It was important to retain the individual accountability of the system because practice in filling out the worksheets was clearly related to gains in basic skills and in understanding of the concepts. However, it was possible to make the group responsible for seeing to it that everyone got the help s/he needed in finishing up the task at the learning center. If groups could not move on to the next learning center until everyone were finished, there would be much more pressure to ask for and accept assistance. In addition, if the group found one of its members wandering or disengaged, there would be considerable motivation for the group to get its member back on task rather than always relying on the adults for this relatively routine task. If the teacher were to be freed from keeping the straggler engaged, it would seem that she would have more time for higher level feedback and for encouragement of the children's thinking.

The results imply a second important conclusion. Since an important negative response to the curriculum was to cut down the number of learning centers in operation so that routine bureaucratic supervision could be used, it was clear that some teachers needed more help in delegation of authority. They were either unable to delegate or did not believe in "letting go" of a traditional role.

The assessment of learning outcomes in this curriculum had shown excellent gains. However, there was important variability in throughness of implementation that was, in turn, linked to variability in learning gains. If we were able to make implementation more consistent from classroom to classroom there is every reason to expect more consistent gains for each classroom. If we were to develop a good training system for groups of students to take responsibility for moving through the tasks at learning centers, those teachers who are reluctant to delegate authority might be persuaded that they would not lose control of the classroom by having groups of students take some specific responsibilities. This is one way to attack the problem of helping teachers delegate authority.

The problem of delegation of authority is not unique to this curriculum. Many of the science curricula that were developed in the 1960's sit unnused on classroom shelves today. One of the reasons given for this failure of implementation is the great difficulty teachers had in maintaining the differentiated activities all these curricula call for. This analysis documents the importance of a failure to delegate authority. It also suggests a solution that would be of general utility in such science curricula.

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PROPOSITION II: EFFECTS OF TEAM TREATMENT

Review of Team Treatment Procedures

Five of the nine teams, it will be recalled, received two extra workshops designed to increase their reciprocal interdependence and to train them to use techniques of Reflective Decision Making. At this point it is important to review, more specifically, just what these procedures were.

In addition to the two workshops that all nine teachers received, the five teams in the Intensive Condition, were asked to attend two extra meetings. These five teams were selected on a random basis. Each of the Intensive Condition teams were asked to hold regular team meetings in conjunction with their special training. It turned out that none of the teams had the habit of holding any formal meetings. They generally felt that they could not ask the teacher aide to put in extra unpaid time. To deal with the problem, the project undertook to pay the aide for meeting time.

Before the first Intensive Condition workshop, a project staff member attended at least one team meeting of each of the five teams and gave the teams a checklist of management problems that might occur. They were to use this checklist while observing their classrooms in action. At the first Intensive Condition Workshop it became obvious, that not only did these teams ordinarily never hold formal meetings, but that they did not see the usefulness of meetings. Evidently their prior experience with teacher and team meetings had been negative. The first task then, was to discuss the potential usefulness of team meetings in connection with solving problems in the management of the classroom and problems with individual students.

The first workshop focused on helping team members reflect on how they divided labor in their classrooms, defined teaching tasks, and identified and treated classroom issues in general. In addition, teams were taught how to set an agenda, to keep track of decisions made in team meetings, and to follow up on previous decisions. Using the management check list that they had been asked to bring to the workshop, they practiced these new meeting techniques by being asked to hold a team meeting during the workshop. They were supposed to identify a problem for discussion from their check list, to discuss it, and to come to some clear decision as to what to do about it. Their homework assignment was then to carry out this decision and to come back to the second workshop prepared to report on what had happened.

The second intensive workshop focused primarily on reflective decision making about students. Teams were provided with alternatives for making judgments about students. The need to consider varied sources of information when making judgments about student work was discussed. In order to practice these new skills in their own classrooms, teams were encouraged to take observation notes on students during FO/D activities and to examine worksheets as a possible source of information on which to base decisions. The main point emphasized in the workshop was that problems students have in completing activities may lie in problems in classroom management and organization.

Teams were given more practice in looking at student problems from a classroom management and an organizational perspective by analyzing a role play of a team meeting done by the project staff. They were told to examine student information brought into the meeting, the kinds of decisions made by the team members, the role of the teacher and aide in the meeting and any other sources of information that were relevant. Project staff emphasized that having a clear

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understanding of any decisions made in the team meeting was crucial in following through that decision in the classroom.

A Two Role System

The teams were made up of teacher and aide and were thus not an equal status team. The workshops took this into account by giving clear expectations to the teacher and aide that differed according to their role. The aide was expected to bring in information, to identify problems, and to make suggestions. The teacher was expected to do the same. In addition the teacher had the final decision making responsibility and the responsibility to make those decisions clear to the aide at the end of the meeting. Both team members had the right to bring items up for the agenda.

Monitoring Team Meetings

In addition to the two workshops, team meetings were closely monitored. During each team meeting, the same project staff member was present to tape record and monitor. Project staff members were instructed to reinforce behaviors in the team meetings that had been emphasized in the workshops. They were specifically instructed not to attempt to influence the agenda or the decisions made by the team. Unfortunately, there were no team meetings recorded prior to the treatments. Furthermore, one team refused to have most of its meetings recorded. Although the project paid for an extra half hour of aide time for these meetings, most meetings took place at odd moments like recess time and as a result, were often interrupted or quite short.

Team Treatment and Curriculum Implementation

The treatment was conceived as a way to increase the interdependence and decision making skills of the team. It did not try to improve implementation in a direct fashion. Because of this conception, the project tried to avoid reinforcing or working on ways to implement the curriculum with the five Intensive Condition teams.

Despite these intentions, there were two important things that happened that may have had a direct influence on implementation of these five teams. The first was that as the five teams discussed problems and with the group as a whole, they began to make suggestions to each other as to effective ways they had found to manage the curriculum. For example, one teacher explained how she controlled individual movement between learning centers. Students were not allowed to move on to the next learning center until they had their worksheet checked out by the teacher or aide. This was their "ticket" to move on. Other teachers found this idea very valuable and subsequently some of them implemented it. Thus, as soon as we allowed such discussion among colleagues, there was an effect on implementation.

The second and unintended effect on implementation came from the presence of the staff member at the team meetings. Frequently, the team members would turn to the Stanford staff member with practical questions concerning when materials were coming from Stanford and how problems with the materials might be solved. The staff member consistently tried to avoid giving problem solutions, but frequently gave out some information or reminded the team of the number they could telephone for assistance. Thus the team meetings could have inadvertently increased the interdependence between Stanford and the site as well as the interdependence of the team itself. It should be pointed out, however, that all

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project participants had a great deal of contact with Stanford, because of the constant flow of observers and materials. Furthermore, very few calls were logged by Stanford from teams in either condition.

The Scoring of Teacher-Aide Team Meetings

Recordings of teacher-aide team meetings in the Intensive Condition were systematically scored with two separate instruments, once using interaction analysis and once using content analysis. The interaction analysis included a record of who spoke and which of a number of categories of speech they made. Interaction was called a single speech as long as it continued in the same category and was not interrupted by another speaker. The system was not an exhaustive one. Only speeches that were relevant to the two role system of interdependence were categorized. The Stanford staff member was also scored when she spoke if her speech fell into one of the categories.

The speech categories included: asking for information, giving information, asking for suggestions, giving suggestions, requesting assistance, offering assistance, evaluating behavior, asking for suggestions regarding decisions to be made or problems to be solved, identifying decisions to be made or problems to be solved, and making decisions with implications for more than one team member. The scorer recorded who was speaking as well as the relevant speech category.

This scoring system enabled us to count how frequently the aide spoke up with information and suggestions. It also enabled us to see to what extent the team was able to identify clear decisions to be made or problems to be solved. If the teacher did most of the work in all these categories and the aide was scored very infrequently, then we had not produced a truly interdependent system. The teacher was, in that case, not dependent on the input from the aide. This was a critical issue because many of the aides were not self-confidenct about their ability to make suggestions and had never been asked for input before.

The second instrument, the content analysis, was a checklist of topics. Scorers went over the recordings a second time in order to check off topics. RDM was indicated by the variety of topics discussed and the variety of student aspects considered. General topics included logistics, teacher and aide roles, decisions with implications for joint teaching or interdependence, specific problems with the curriculum, and evaluation of learning benefits. Student aspects were checked off when a specific student was discussed. These included descriptions of observed behaviors, skills, interests, data sources, and whether or not decisions were made regarding individual students. A more detailed list of topics can be found on the Content Analysis Checklist included in Appendices. The scorer checked off topics as they were discussed. If a topic were brought up more than once it was checked off again. The unit of analysis for a given topical check was a speech or a team discussion on a particular topic. If the team went on to discuss a different issue although it was basically the same type of topic, the scorer checked that topic once more. For example, a team might bring up one particular problem with the curriculum at one of the learning centers and then a member might start discussing another problem with another learning center. This would count as two separate checks under "Specific Problems with the Curriculum".

Reliability of Scoring System

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There were 21 meetings of varied length on which we had audiotapes. The number and length of meeting for each team are given below in Table 6. Unfortunately, because meetings were held during the school day, the problem of background noise was very serious. Many of the audiotapes were extremely hard to understand. This presented an obvious problem for reliability.

TABLE 6 HERE

The solution we finally arrived at was one of having two scorers, Susanna Mata and Brenda Stevenson, listen to each tape together. Mata had a been a project staff member assigned to monitor meetings; Stevenson had been a classroom observer. Jointly they worked out what soft-voiced teachers and aides were saying. Then they scored simultaneously, stopping to argue when they disagreed and coming to concensus on a final score. This was an expensive and time-consuming solution, but was virtually the only way we could use these data. Mata and Stevenson helped to design and refine the scoring system, so that they had a fundamental understanding of its purposes.

Cohen participated in this process in two ways. She worked with the staff members as they refined the scoring system, listening to tapes with them and discussing difficult issues of scoring. The scorers did not start on the offical tape scoring until the scoring system was in final form. During the scoring, Cohen was given several of the better quality tapes to score for an independent reliability check. She scored three meetings for each of the two instruments. The percentage agreement was consistently 90% or better

Results of Team Meeting Analysis

There were two major issues for the analysis. The first was to decide whether or not we had been successful **in an absolute sense** in making the teachers reciprocally interdependent and in teaching the skills of reflective decision making. This was judged by counting up the frequency of behaviors and topics measuring these two concepts as they occurred during the meetings. We had no comparison group with which to constrast the observed frequencies. The other teams did not have meetings. They conferred "on the wing" and before class as they bustled about getting ready for the day. Furthermore, we had no recordings before the workshops took place. Therefore we were forced to consider whether or not we could see specific behaviors and subjects that indicated the presence of the two concepts of interest. We could describe these characteristics in the team meetings although we have no way of knowing, for sure, that these characteristics were the result of treatment. We can only say that the Intensive Condition teachers had much more communication than the Economic Condition teachers, in that they had all these extra meetings.

The second issue is the test of the proposition on implementation.

> Reciprocal interdependence and RDM in the team meetings will be associated with better implementation of the curriculum.

There were two possible ways to examine evidence for this proposition. One was to compare the implementation of the five teams of the Intensive Condition to that of the four teams of the Economic Condition. If it could be shown that there was reasonable evidence both for reciprocal interdependence and reflective

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decision making in each of the treated teams, one could argue, that at minimum, these behaviors were more characteristic of treated teams than of the untreated teams who held no formal meetings at all.

The second possibility was to assign scores on the independent variables to each team, based on their meeting data. Using data from the Target Child Instrument one can select student behaviors that indicate successful implementation of the curriculum, such as talking and working together. Each target child in the five classrooms of the treated teams can be assigned a score for reciprocal interdependence and reflective decision making of his/her team of teachers. In this analysis we treat the team score as a contextual variable with a possible effect on successful implementation. We are here examining the variability within treated teams as compared to treated vs. untreated teams in the first method of analysis described above.

We begin by describing the occurrence of the independent variables in the team meeting data. We provide the basis for assessing whether or not these teams exhibited the desired behaviors. Then we proceed with the test of the proposition concerning implementation. Thirdly, we present a discussion of the findings.

Reciprocal Interdependence

Reciprocal interdependence scales were developed for teachers and aides separately, and also for the team as a whole. The operationalization of reciprocal interdependence focuses upon whether or not the team members operated in the kind of two role system we had taught in the workshops. Relevant speeches of the teacher included asking for information, giving information, asking for suggestions, giving suggestions, identifying decisions to made or problems to be solved, evaluating behavior, and making decisions with implications for more than one team member.

The source of these data was the interaction analysis of the team meetings. The observed behaviors were added together for each teacher over all meetings. These totals were standardized by dividing by the total length of time spent in meetings. Thus, each teacher had a rate per minute of observed reciprocal interdependence. The Cronbach Alpha for the reliability of these variables in forming a scale was 0.73.

Aide reciprocal interdependence included giving information, giving suggestions, and identifying problems. The Cronbach Alpha for the reliability of these variables as a scale was 0.70. Rates per minute of aide reciprocal interdependence were calculated as they were for teacher reciprocal interdependence. The scales for aide and teacher reciprocal interdependence were significantly correlated ($r=0.82$; $p=0.00$).

A scale of team reciprocal interdependence was developed using the following variables: teacher requesting assistance, aide requesting assistance, teacher offering assistance, and aide offering assistance. Team reciprocal interdependence was not considered in further analysis as these behaviors were virtually not observed.

Rates per minute of teacher and aide reciprocal interdependence are presented in tabular form in Table 7 and in graphic form in Figure III. The teacher and aide teams can be classified according to the amount and balance of observed reciprocal interdependence. Team #9 showed the most evidence of reciprocal interdependence while Team #5 showed the least. Teams 2, 3 and 7 gave evidence of moderate reciprocal interdependence. Teachers showed evidence of reciprocal

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interdependence an average of 2.30 times per minute and aides showed evidence of reciprocal interdependence 1.17 times per minute. One would expect teachers to play a more dominant role. These figures demonstrate that teachers and aides were interacting in a reciprocally interdependent fashion on a regular basis. Even Team #5 gave considerable evidence of the operation of the prescribed two role system. In this team the teacher rate of reciprocal interdependence was 1.4 per minute and the aide rate was .59 per minute. Even the least self-confident aide operating with the most dominant teacher was able to enter into the discussion with suggestions and information.

TABLE 7
FIGURE III HERE

Reflective Decision Making

As defined above, RDM refers to the breadth and thoroughness of the decision making and to the rational or cyclical character of the decision-making process.

Breadth was operationalized as the total number of different topics the teacher and aide mentioned during the team meeting. The topics were those listed in the content analysis instrument. Grouped under general headings they referred to:

a) students: skills (strengths and weaknesses), interests, characteristics (physical or psychological), and their behavior;
b) classroom process: logistics, behavior management, division of labor, reciprocal interdependence, recordkeeping;
c) curriculum characteristics: special problems, learning benefts, negative features, tests, performance on worksheets, or teacher observational notes on students.

A count of whether or not teachers made reference to a topic across any of the scored meetings showed a range of 11-18. Maximum number that could have been coded was 19. If we used the raw total, teachers for whom we had more data on meetings would have higher scores on this measure. Therefore, we constructed a rate per minute by dividing the number of topics mentioned by the number of minutes they met. Table 8 compares the teams on the comprehensiveness or breadth of their discussion of classroom issues using this standardized score.

TABLE 8

Thoroughness is the extent to which the team follows through on the issues they discuss. In the case of FO/D teams did not have to create learning tasks and follow them through, so the only reasonable measure of this concept was the number of students who were discussed in each team meeting. Results varied from a third of the class to the entire class. To be fair to those teams that met for less time, we again utilized a rate per minute. We could then rank the teams on a measure of thoroughness. Results are reported in Table 8. The scores ranged from .7 of a student per minute for Team #9 to only .1 of a student per minute for Team #3.

The cyclical character of decision making by the team was measured with variables from the Content Analysis (CA) and from the Interaction Analysis (IA). In order to create an index of the quality of decision making the frequency of each of the following behaviors or topics was added yielding a total composite score:

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a) Teacher or aide identified problem (IA)
b) Teacher or aide isolates problem or decision (CA)
c) Reference to agenda or checklist (CA)
d) Clear decision made (CA)
e) Reference to implications of decisions made for teacher/aide behavior
f) Evaluation of systems and decisions (CA)
g) Test data, Teacher notes, Observation of behavior, records used for basis for evaluation (CA)
h) Made explicit recommendation for future decision (CA)

Variables a-e above are prerequisites to a cyclical character in decision making. In order to consider the success/failure of past decisions, one has to know what decisions have been made. The use of objective data, measured in variable g in the above list, is one way to have inputs to the decision available for re-examination. The occurrence of explicit evaluation of systems and decisions (f) is exactly the cyclical process we are attempting to capture in the coding scheme. Finally, variable h, recommendations for future decisions, refers to the process of using present discussion to inform future decisions.

After the frequency of these variables was added for each team, the total was divided by the total number of minutes of meeting time for each team. The results are included in Table 8. Examination of the component scores for each of the variables in the index revealed one particularly gratifying result. The most frequently occurring variable was evaluation of systems and decisions. The raw frequencies ranges from 22 for Team #2 to 9 for Team #5. This kind of highly rational, organizational behavior was rarely reported by teachers in Intili's earlier study. It was, however, stressed in the workshop instruction.
The final scores on this measure of decision making (referred to as "Evaluation") shows that some aspect of it occurred quite frequently with the possible exception of Team #3. Team #9 had a rate of .88 per minute. Teams #3 and #7 also showed this behavior quite frequently with scores of .64 and .59. Even Team #2 mentioned something relevant to this score on the average of .36 times every minute.

Table 8 rank orders the three scores on RDM for each team. A simple examination of these rank orders by eye shows strong positive association. For example Team #9 holds first rank on two out of three components and second rank on the other. Team #5 holds bottom rank on all three components. The last column of Table 8 contains a summary RDM score, calculated by adding the three component scores. A rho was calculated on all possible comparisons of rank orders in this table. Each value of rho turned out to be the same-----a value of .8.

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Implementation in Intensive vs. Economic Conditions

The first test of the proposition was a comparison of implementation in classrooms of treated and untreated teams (Intensive vs. Economic conditions.) All treated teams gave some evidence of the two desired behavior patterns: reciprocal interdependence and reflective decision making. Thus we can assume that these behaviors were more characteristic of them than of the untreated teams who never even had formal meetings.

As measures of implementation we examined the percentage of students reading or writing, the percentage of students talking and the mean number of learning centers in use (taken from the Whole Class Observation Instrument). We also examined the average number of worksheets completed per classroom. These measures were standardized and combined into a total implementation score. Table 9 presents the average values for each of these variables for classrooms of treated and untreated teams. A t test for differences between means was calculated for each comparison.

TABLE 9 HERE

For each of these comparisons on implementation, the treated teams had a higher score than the untreated teams. However, the N's are only 5 and 4 teams; so it is not surprising that none of these comparisons reached statistical significance. The largest mean difference was for percentage of students talking and the smallest mean difference was for percentage of students reading or writing.

Next we compared the average rate of talking and working together for target children in the classes of treated vs. untreated teachers. This comparison of means is given in Table 10. The average rate of talking and working together in classrooms of treated teams was .87 while the average rate in untreated team classrooms was .54. A t test of the difference between these means yielded a statistically significant value of t at the .01 level.

TABLE 10 HERE

Reciprocal Interdependence and Implementation

Next we tested the proposition on implementation by examining the variation within treated teams on reciprocal interdependence. This variation was compared to the implementation measures in the five classrooms of the Intensive Condition.

It was not possible to do statistical comparisons at the classroom level with only five treated classrooms. At this level, a visual inspection of the overall rank of the teams on average reciprocal interdependence for teacher and aide with the rank on overall implementation score was the most appropriate way to proceed. This is pictured in Figure IV, a histogram, with the values for the implementation score and reciprocal interdependence score represented for each team as a bar. The average values for the composite measure of RDM are also included in the figure.

FIGURE IV HERE

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Team #9 had the highest score on reciprocal interdependence and also received the highest overall implementation score. However, the other four teams were ordered very differently according to these two criteria. Team # 2 which had the second highest score on reciprocal interdependence was at the bottom of the rank order on implementation. There was little overall agreement on rank order between these two criteria.

It was possible to test this relationship using a larger N by moving to the level of the Target Child Instrument. Here we could select out the target children in the Intensive Condition and assign to each child the average value of their team's reciprocal interdependence as a contextual variable. Then we could correlate this variable with the observed rate of talking and working together for each child, a prime measure of implementation. This correlation proved to be only .04 and was clearly not significant with an N of 57 children.

Reflective Decision Making and Implementation

Turning to the other measure of team functioning we carried out analyses parallel to those just described. Figure IV included the composite RDM score for each treated team along with the total implementation score. Here the parallel between ranking on RDM and ranking on implementation was closer than for reciprocal interdependence, but by no means perfect. Teams #9 and 7 were first and second in both rankings. However, Team # 3 was lowest in RDM and in third rank in implementation.

A Pearson correlation on the relationship of the team's RDM score to the observed rate of talking and working together yielded a coefficient of .135. Although higher than the coefficient for reciprocal interdependence it did not reach statistical significance.

Discussion of Results of Team Treatment

The descriptive results suggest that the teams did play their roles as we had recommended. Both teacher and aide brought in information and suggestions to the team meetings. Each team gave evidence of a pattern of reciprocal interdependence. The results on the aide behavior suggest success on the difficult task of persuading the aide that her suggestions were important and worthwhile. The staff members felt that they had spent much time in encouraging the aide to make suggestions and to speak up. Aides felt that they were not sufficiently educated to make such a contribution.

For each of the three components of RDM, teams, with the possible exception of Team #3, showed substantial rates of these behaviors. Especially impressive were the frequencies of evaluation of the overall system. This was a behavior quite absent in the survey Intili carried out on a very large sample of elementary school teams. Evaluation of decisions seems particularly significant here. Teacher and aide time is so scarce a resource; and the curriculum material so complex and overwhelming, that this is quite an impressive achievement although we did stress it in the workshop. It is unlikely that untreated teams would have talked on this abstract level, even if they did hold meetings. Looking back to the workshops it seems that having teams practice meeting behavior and report out their decisions to the group as a whole was probably an effective teaching technique and should be retained in connection with the curriculum.

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There were some features of the workshops, however, that were not reflected in team behavior. For example, they did not make explicit references to an agenda or to the management checklist as we had suggested. Nor were the implications of the descision making discussed and summed up by the teacher, as we had recommended. Also, in dealing with data from specific children, they rarely referred to anything but observed behavior. They did not use observation notes, evidence from the worksheets, children's test scores or their skills and interests. The last finding was not surprising in light of the fact that we rarely saw the teacher talking to children about their skills and interests.

Overall, the teams appeared to reflect those behaviors that the staff had emphasized strongly and those particular skills to which the staff had devoted a substantial amount of training time. Other desired behaviors that were recommended in the workshops but were not so greatly emphasized, tended not to show up.

It is clear that we are able to answer the descriptive question for team meetings in absolute terms: Did they operate as we had suggested in the workshops? What is much less clear is the answer to the question: Did they operate this way as a result of what they learned in the workshops? This question cannot be answered with any great certainty because we have no comparision groups; the other four teams had no formal meetings to record.

It is hard to imagine how five teams could have begun to operate in this way without the influence of the workshops. At the first Intensive Condition workshop, they frankly stated that they did not see any use in having meetings and confessed to having none on a regular basis. They handled decision making in a few minutes of talk just before classes started and during class time. These conditions do not seem conducive to the decision making process we advocated. Nor would the aide be likely to hold her own under such time pressure; it seems more than likely that the teacher would play a dominant and directive role.

Nevertheless, it is necessary to consider an alternative explanation for these descriptive findings. Something about the curriculum itself may have produced the meeting behavior we observed (given the fact that we paid for meeting time). The question of the effect of the curriculum itself on reciprocal interdependence must be taken up separately from its effect on RDM.

There are good sociological grounds for arguing that the effect of a curriculum of this complexity would be to push the team toward greater communication than they had before the curriculum was implemented and in comparison to other less complex curricular areas within the classroom. Mata finds in her dissertation analysis of these same teachers and aides operating in the classroom that they were significantly more likely to be seen conferring during FO/D class time than during their own math classes (Mata, in progress). The math classes had many fewer groups and different types of materials than FO/D. Thus reciprocal interdependence in the classroom situation does seem to be a function of curriculum complexity. There was no relationship between this observed interdependence in the classroom and the rates of reciprocal interdependence during team meetings. This suggests that the effect of curriculum complexity is restricted to work arrangements operating at the same time as the technology. Other sociologi-

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cal studies of work arrangements and technology have similarly found that the effect of technology is visible only for the groups working most closely with the technology. It seems unlikely that the team behavior was a function of the curriculum itself; it is more likely that it was a result of treatment.

The case for the effect of the curriculum on RDM is not strong. The FO/D curriculum did encourage teachers to take a broader view of instruction. However, they were burdened with so much work in figuring out how the activities worked and facilitating students' progress through the learning centers for the first year of the curriculum, that it seems to us unlikely that they would have engaged in these behaviors just as a consequence of the curriculum. They would in all likelihood have been oriented to "survival" for the 15 curriculum weeks. Shavelson (1981) and others who have studied decision making of teachers find that their general tendency is to routinize decision making rather than expand it. In addition, the early study of Intili found that the cyclical aspect of RDM was infrequent even among teachers who employed highly sophisticated diagnostic-prescriptive teaching methods.

Treatment and Implementation

Discussion and decisions dealt with particular learning centers and the division of labor between teacher and aide rather than with overall problems such as maintaining all the learning centers in operation at once or encouraging the children to talk and work together. This may have been a reflection of their newness to the curriculum and of the fact that there were still minor design problems with some of the curriculum activities. Some teams, such as Team #2, focussed almost completely on problems with the curriculum, and seemed to be addressing remarks mainly to the Stanford staff in order that they would know what activities should be amended. This led to a high score on reciprocal interdependence but a low score on RDM.

In future workshops we decided to assist reflective decision making by providing explicit guidance in the shape of a report that had to be filled out on the exact decisions made by the team and noting actions implied by these decisions for each team member. In this way, we planned to increase the explicit character of the decision making process. In addition, the management checklist required revision. There was not a great deal of evidence that the teachers used it very extensively. It needed to be brought up to date in light of the data analysis; the current revision only emphasizes those management features known to be critical in the implementation process.

Treated teams, as a whole, had better implementation than untreated teams although the differences between the means were not statistically significant. However, on every single implementatation measure, the difference was in the predicted direction. Also, children talked and worked together at a significantly higher rate in the Intensive Condition than in the Economic Condition. Furthermore, in an early analysis involving all students, De Avila had found that condition was a signficant source of variation in test scores (De Avila, 1981). Children in classrooms of treated teachers scored significantly better than children in classrooms of untreated teachers. Given that the rate of talking and working together was associated with treatment and that this behavior was critical for learning,

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we are now in a position to understand the earlier finding on learning outcomes as a function of improved rates of prescribed learning behavior in treated classrooms.

It is not completely clear whether these findings are strictly a function of the emphasis on reciprocal interdependence and RDM in the workshops. It may have been a side effect of the significant exchanges that took place between teachers during the Intensive Condition workshops. As described above, they did exchange suggestions on implementation, and we did know that some of these suggestions were followed by other teachers. In other words it is possible that there may have been direct effects on implementation of the Intensive Condition that were not mediated by the functioning of the team. That is why the analysis evaluating the effect of variation between treated teams of the desired behaviors was important. It was the only way to separate team functioning from the experience of the workshops.

There was little relationship between reciprocal interdependence and implementation. There was no agreement in the rank order of classrooms on the two measures with the exception of top-scoring Team #9. Furthermore there was no relationship between the rate of talking and working together of target children and the team score on reciprocal interdependence.

There was a tendency toward a positive relationship of RDM to total implementation. The top two teams were ranked the same on the two measures. The correlation between RDM and the rate of talking and working together among target children was positive but not significant.

These results raise an interesting sociological issue: previous research had documented a correlation between reciprocal interdependence and RDM and maintenance of a complex instructional technology. In many organizations and in classrooms in particular, sociologists have found that as the technology becomes more complex, the reciprocal interdependence increases. However, there is not too much evidence that causal arrows flow in the other direction, i.e. from work arrangements to the complexity of the technology. Rather most of the evidence suggests that increasing complexity of the technology changes the work arrangements. The question here is: Can changes in the work arrangements help to maintain complexity of the technology?

Intili reasoned that RDM would not only be stimulated by technology but would have an independent effect on the maintenance of a complex technology. The results from this analysis are by no means definitive. They suggest that reciprocal interdependence is a necessary but not a sufficient condition for implementation of this curriculum. RDM appears to have a stronger potential for assisting in dealing with its complexities.

This analysis yielded an important practical conclusion: It is a mistake to separate implementation from team functioning in training teachers. We had attempted to keep them separate as a matter of research design. However, from a practical point of view, it makes much more sense to connect RDM and reciprocal interdependence specifically to those features of implementation we know to be critical for learning. Certainly, making reflective decisions about critical dimensions of implementation will do more to improve implementation than making reflective decisions only about logistics or specific learning centers.

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If, as was the case with Team #2, the teacher did not understand delegation of authority, no amount of reciprocal interdependence would solve this problem of implementation for her. In other words, it is critical for the teachers to realize (1) what the critical dimensions for implementation are and (2) that meetings should be devoted to a self-conscious discussion of how implementation on these particular dimensions might be improved.

In order to do this they will have to (a) have a fundamental understanding of the critical dimensions of implementation; and (b) they will have to function in a reciprocally interdependent manner. However, reciprocal interdependence, by itself will not solve problems of implementation.

SUMMARY AND IMPLICATIONS FOR PRACTICE

Findings

There was marked variability in the extent to which these nine teachers delegated authority to the students. Furthermore, when teachers did delegate authority it was not to groups but to individual students. Lateral relations between the students were permitted but not required.

There was equally marked variability in the extent to which teachers used routine bureaucratic supervision. Although these strategies were negatively related to each other, there was one very successful team that used a combination of small groups and individuals at learning centers alternating with whole class sessions (routine bureaucratic supervision) for orientation and wrap-up.

We found comparatively little of what we had called "supportive supervision." Teachers rarely gave feedback to individuals on anything other than the current activity. Furthermore they rarely attempted to encourage the child's thinking skills by helping him/her extend activity or to generalize thinking. We identified a third strategy where a teacher talked to many individuals, providing feedback on current tasks.

To describe these patterns of behavior in everyday language, some teachers reduced the curriculum to fewer groups so that they and their aide could supervise directly. Other teachers got students to take more responsibility for their own behavior; in these classrooms one would see a pattern of students working together and students working alone without so much direct supervision; students were moving about the classroom in a business-like fashion. Teachers who delegated authority in this way might or might not be seen moving rapidly about the classroom, working to facilitate those individuals who tended to become disengaged. For some teachers this latter pattern predominated; and the teacher almost appeared to be on roller skates as she whizzed about the classroom keeping the system going by vigorous assistance and direction for individual students.

Which strategy the teacher employs is of critical importance for the implementation of this curriculum. As we had hypothesized, delegation of authority is very strongly related to all implementation measures and to learning outcomes. Also, as we had predicted, the use of routine bureaucratic authority is negatively related to implementation and learning outcomes.

The pattern we called Working with Individuals was unrelated or negatively related to implementation and learning outcomes. However, there was a negative relationship between disengagement and this pattern, suggesting

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that this kind of behavior served to keep down the level of disengagement, given a decentralized set of learning centers. Individual teachers showed many different combinations of these three strategies. The most successful team used all three strategies, although their direct supervision of large groups was restricted to orientations and wrap up sessions.

The second part of the analysis examined the treatment of five teams offered in what was called the Intensive Condition. The twin goals of this treatment were to create reciprocally interdependent teams by showing the teachers and aides how to have effective meetings where both played important roles and to teach the teams how to make decisions that were were both explicit and subject to evaluation. Examination of data from the team meetings showed considerable evidence of both these kinds of behavior. There were, however, some specific behaviors recommended in the workshops that we did not observe in the team meetings.

Did the Intensive Condition treatment result in superior implementation as predicted? In general, the answer to this question appears to be : Yes. The children in the Intensive Condition were significantly more likely to be talking and working together, a key measure of implementation. Also the average implementation of Intensive Condition classrooms was superior although not statistically significantly so.

Finally, analysis of variation within the five teams on reciprocal interdependence failed to show any relationship between reciprocal interdependence and implementation. There was only a weakly positive relationship between RDM and implementation.

Implications for Instruction

We have been able to document a strong relationship between the teacher's strategy of coordination and control and the implementation of a complex curriculum as well as the learning outcomes. This illustrates the value of applying organizational theory to management of the classroom. Control strategies are often called "teacher style" or are considered a matter of ideology. They should be seen as a technique that depends on the complexity of the instruction the teacher wants to implement. Given a complex type of instruction, delegation of authority rather than traditional direct supervision should be the preferred technique.

If the goal is to implement an innovation involving complex instruction, then it is necessary to find out how to support and instruct teachers so that they will know how and when to delegate authority. Some of the teachers in this study had considerable difficulty in this respect. Other students of implementation such as Fullan have also noted that the most difficult programs to implement are those that require a change from traditional teacher roles.

We have come to the conclusion that teachers should be aware of these general sociological principles. If they saw the reason why it was necessary to allow the children to work with each other and if they understood that this did not mean losing control of the situation, they would be much more willing to try the technique. It is also necessary to ensure that the principal does not undermine this method of management by evaluating the busy classroom where the teacher has delegated authority as "lacking in discipline."

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FO/D represents a general approach to instruction rather than a particular curriculum. There are other curricula that have the same character from a technological point of view. For example, many of the science curricula of the 1960's now sit on the shelves of classrooms. Teachers found that they were unable to implement these curricula properly. One of the reasons for this failure is undoubtedly the problem of delegation of authority. Science educators have never looked at the problem in this way. We are convinced that this is a fruitful avenue to solving a problem that has long plagued the field of science education. If teachers and curriculum specialists were to understand the changes in teacher's management that must take place when multiple activities operate in the classroom, and when we want students to talk and work together, many problems of implementation might be solved.

Implications for Current Dissemination of FO/D

This detailed study of the relationship between team treatment, teacher strategy and implementation was not an academic exercise. We have already used the results to redesign the initial workshop for FO/D. This summer 18 teachers from the San Jose area experienced the revised workshop. This time the workshop lasted two weeks and operated from 9 to 4 each day. The workshop was funded by the Bilingual Consortium who wanted to see this successful approach to thinking skills implemented in more schools.

The analysis found that delegation of authority is critical for successful implementation. This was the case for every measure of implementation, that we knew to be related to the learning process and to favorable learning gains. Yet some of the teachers clearly did not know how or were not willing to do this and relied too much on routine bureaucratic supervision with too few learning centers in operation. Even those teachers who did delegate authority, tended to spend much of their time facilitating disengaged students. From the point of view of the curriculum developers they were not spending nearly enough time in extending children's activities, stimulating the students to analyze and generalize and giving feedback on subjects ther than the current activities and worksheets.

On the basis of these findings we made the decision to change the recommended method of delegation to one where groups rather than individuals were charged with the responsibility of finishing each learning center and seeing to it that each individual in the group had completed his/her worksheet. There was still individual responsibility in that each child still had to finish each task and turn in an individual worksheet. However, the groups were much more interdependent because they could not move on to the next learning center until everyone in the group had finished.

We developed a set of training experiences for the children so that they would know how to ask for help, how to give help, how to explain things to other students, and how to take responsibility for one's group. In addition, we introduced a set of roles. Each child in the group plays a different role; the roles rotate over time. One key role is that of the facilitator who is responsible to see to it that everyone in the group gets the help s/he needs . The facilitator also informs the teacher when the group is ready to move on.

There are a number of important advantages to these work arrangements of the students:

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1. We felt that teachers would be more willing to delegate authority if we provided a training system where there were clear rules and roles for the students. They would worry less about the classroom being "out of control"; and it would be harder to attempt direct supervision once this system were set up and in operation.

2. Students would take over some of the duties of the teacher in providing facilitation for each other. They would also keep group members on task in order to avoid having to wait for those who lagged behind in getting their job done. This would free the teacher to do the higher level work of extending the activities, of asking questions and of stimulating the children's thinking skills.

3. If talking and working together produce conceptual learning in FO/D, than this system should produce even higher rates of this behavior.

This decision meant that the workshop would have to be longer and more complex. Teachers would have to acquire a more fundamental understanding of why and how to delegate authority. They would also have to learn how to train the children in the necessary cooperative skills and for the new roles. Cohen and Navarette developed a number of materials for this purpose. The implementation manual developed for this summer's workshop, had a section on cooperation and rules and roles that is reproduced in the appendix to this report.

During the workshop the teachers actually taught a multilingual group of volunteer children during the second week. While the teachers were learning fundamental principles and acquainting themselves with curriculum material, the children were taken thru the cooperative training program. The teachers experienced an adult version of the same program. During the second week the teachers operated as two person teams. Each team taught for one hour, having the chance to orient the students to learning centers, to reinforce cooperative skills, to practice extending activity and stimulating the chldren to think, as well as finding out what it was like to keep multiple learning centers in operation.

The teams were observed by other teams and by the coordinators. Included in the observation guide were many items concerning how well the system of delegation of authority was operating:

How many centers were in operation?
How much talking and working together were going on?
Were the teachers hovering over groups?
Were students playing their roles?
Were teachers helping children to generalize and analyze?

These were some of the topics the observation guide covered. This helped to internalize the basic principles of coordination, control and effective implementation.

As a result of the evaluation of the team treatment, we included in the workshop a session on training the teachers to operate as a team. This time we trained two-person teacher teams rather than teacher and aide. Aides are becoming increasingly scarce in this area.

Analysis had suggested that if we tied reciprocal interdependence and RDM much more closely to what what we now know to be critical dimensions of implementation, we would get even more consistent implementation results from better functioning teams. We simplified the method of setting the agenda for meetings, tying it more closely to problems of implementation.

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Intili designed a "Meeting Tamer" to help the team make their decisions more explicit. The "Tamer" asks the team to note down the decisions that have been made and who is supposed to do what to whom, when and where. This document is included in the Appendix.

These changes are only part of the revised implementation model. We are also concerned with how to make the approach to instruction self-sustaining in the school. We are dealing with the central problem of the isolation and lack of support for the classroom teacher. The details of this model and the plans for its evaluation are, however, outside the scope of this report.

One of the most encouraging features of this summer's experience was the response of the teachers to strategies based on organizational sociology. Abstract principles were introduced only after the teachers understood the practical problems presented by the instruction and after they understood the empirical and theoretical relationship between learning and talking and working together. Teachers felt that these strategies were one of the most practical and generally useful tools they had ever experienced in a workshop. They were also very excited by truly professional interchange that took place in the team meetings. They said they had never received so much feedback in their lives. Perhaps after all, Lewin was correct in stating that: "There is nothing so practical as a good theory."

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TABLE 1

Indices of Coordination and Control: Intercorrelations of z Scores of Component Items

N = 9 teams

	% in Groups	TC Offers Assistance	% Works Alone	T Facilitates	T Asks Questions	TC in Transition (on business)
% in Groups	1.00	-.03	.45	.31	-.05	.54
TC Offers Assist.		1.00	.59*	.35	.70*	.19
% Works Alone			1.00	.40	.46	.43
T Facilitates				1.00	.65*	.16
T Asks Question					1.00	-.09
% In Transition (on business)						1.00

* $p < .05$

Note: T.C. = Target Child; T = Teacher.

TABLE 2

Average Number of Acts Per Minute of Teacher Feedback Variables

N = 9 Teachers

Feedback Variables	Average Rate Per Minute	S.D.
Feedback on Previous worksheets	.34	1.26
Feedback on Current Activity	1.93	.04
Feedback on General Progress	.38	.08
Feedback Working Together	.16	.61
Talks about Student Interests	.10	.47
Talks about Student Skills	.05	.22
Talks aout Student Feelings	.01	.09
Overall Feedback Index	2.85	4.09

TABLE 3

Intercorrelation of Control and Coordination Strategies

N = 9 teams

	Delegate to Individuals	Routine Bureaucratic Supervision	Works with Individuals
Delegate to Individuals	1.00	-.74**	-.02
Routine Bureaucractic Supervision		1.00	.36
Works with Individuals			1.00

** $p < .01$

TABLE 4

Correlation of Control and Coordination Strategies with Implementation of Curriculum and with Disengagement: For Nine Classrooms

	Implementation Measures					
Strategies	% Students Read/Write	% Students Talking	Mean # L.C.'s in Use	Mean # Work-Sheets	Total Imple-mentation	% Dis-engaged
Delegate to Individ.	.42	.22	.70*	.20	.84**	-.01
Routine Bureaucratic Supervision	-.36	-.36	-.59*	-.02	-.61*	-.06
Works with Individ.	-.09	-.57*	.03	-.18	-.12	-.49

* $p < .05$

Legend: % Students Read/Write and % Students Talking refer to the percentage of students in these activities on the Whole Class Observation.
Mean # L.C.'s in Use refers to the average number of Learning Centers seen in use on the Whole Class Observations.
Mean # Worksheets refers to the average number of worksheets collected per child in those classrooms.
Total Implementation is a combination of these four variables.
% Disengaged refers to the percentage of students disengaged on the Whole class Observations.

TABLE 5

Correlations of Coordination and Control Strategies with Post-Test Scores (Partialing out Pre-Test Scores):

	Post-Test Scores					
STRATEGIES	CTBS Math (N=150)	Comput. Subscale (N=172)	Applications Subscale (N=151)	Concepts Subscale (N=166)	CTBS Read (N=169)	Content Referenced Test (N=210)
Delegates to Individuals	.20*	.08	.28***	.22*	.10	.15**
Works with Individuals	-.25***	-.24***	-.03	.01	-.05	.10
Routine Bureaucratic Supervision	-.23**	-.17**	-.22**	-.15*	-.08	-.11

* $p < .05$
** $p < .01$
*** $p < .001$

TABLE 6
Number and Length of Meetings Recorded Per Team

Team # (in Minutes)	# Meetings Scored	Mean Length	Total Minutes
2	6	18.33	110
3	4	13.75	55
5	5	20.20	101
7	3	10.67	32
9	3	8.0	24

TABLE 7

Rates per Minute of Teacher, Aide, and Team Reciprocal Interdependence (R. L)

School	Teacher R. L	Aide R. L	Team R. L
2	2.6455	1.1364	0.0364
3	2.5818	0.9636	0.0000
5	1.4059	0.5842	0.0000
7	2.2188	1.2188	0.0000
9	2.6250	1.9583	0.0000

TABLE 8

Scores and Rank order of Components of RDM and Total RDM : For Five Treated Teams

Team Number	Breadth		Thoroughness		Evaluation		Total (B+T+E)	
	Rank	Raw	Rank	Raw	Rank	Raw	Rank	Raw
2	4	.14	3	.32	4	.36	4	.82
3	3	.33	4	.22	2	.64	3	1.19
5	5	.11	5	.10	5	.18	5	.39
7	1	.44	2	.44	3	.59	2	1.47
9	2	.38	1	.71	1	.88	1	1.97

TABLE 9

Mean Z Scores on Implementation Measures
for Classes of Treated and Untreated Teams

Implementation Measure	Treatment	# Teams	Mean Z Score	t value
% Students Read/Write[1]	Yes	5	+.012	.08
	No	4	-.001	
% Students Talking[1]	Yes	5	+.038	1.69
	No	4	-.247	
Mean No. Learning Centers in Use[1]	Yes	5	+.242	.83
	No	4	-.357	
Mean No. Worksheets Completed	Yes	5	+.064	.29
	No	4	-.064	
TOTAL IMPLEMENTATION SCORE	Yes	5	+.089	1.16
	No	4	-.167	

1. Each of these measures was taken from Whole Class Observation Instrument

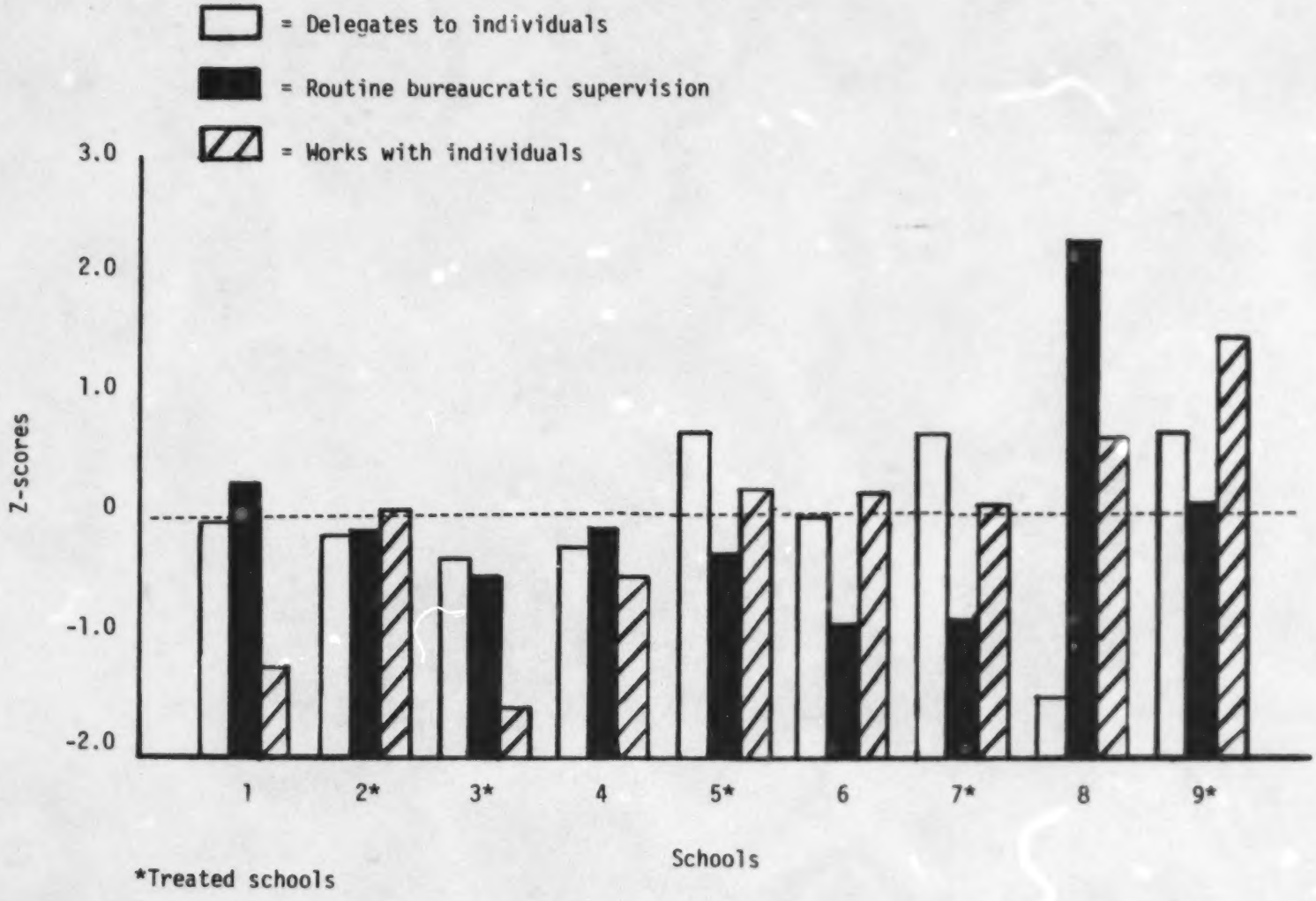
TABLE 10

Rate of Talking and Working Together of Students
in Classes of Treated and Untreated Teachers:
Target Student Observations

Treatment	N of Students	Mean Rate Talk/Work	t value	2-tail prob.
Yes	57	.87	2.51	.01
No	43	.54		

Figure 1

Standardized Scores on Three Strategies for Each Team:
Delegates to Individuals, Routine Bureaucratic Supervision and Works with Individuals



*Treated schools

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Figure 2

Z-scores for Overall Implementation & Percent of Students Disengaged: All Schools

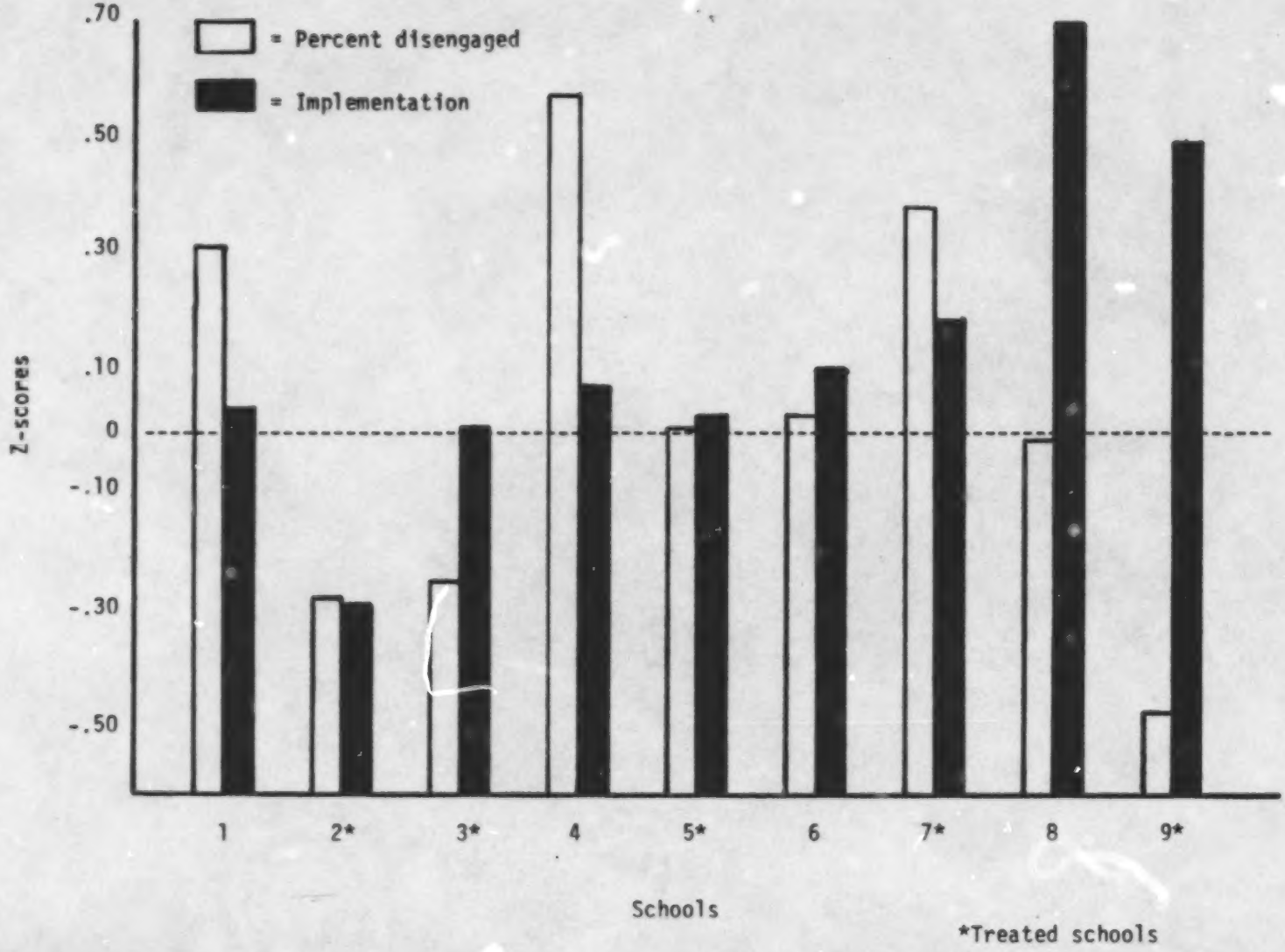

FIGURE III

RECIPROCAL INTERDEPENDENCE SCALES

TEACHER RECIPROCAL INTERDEPENDENCE: Asks for Information, Gives Information, Asks for Suggestions, Gives Suggestions, Identifies Problems, Positive Evaluation, Decisions with Implications for Behavior

AIDE RECIPROCAL INTERDEPENDENCE: Gives Information, Gives Suggestions, Identifies Problems

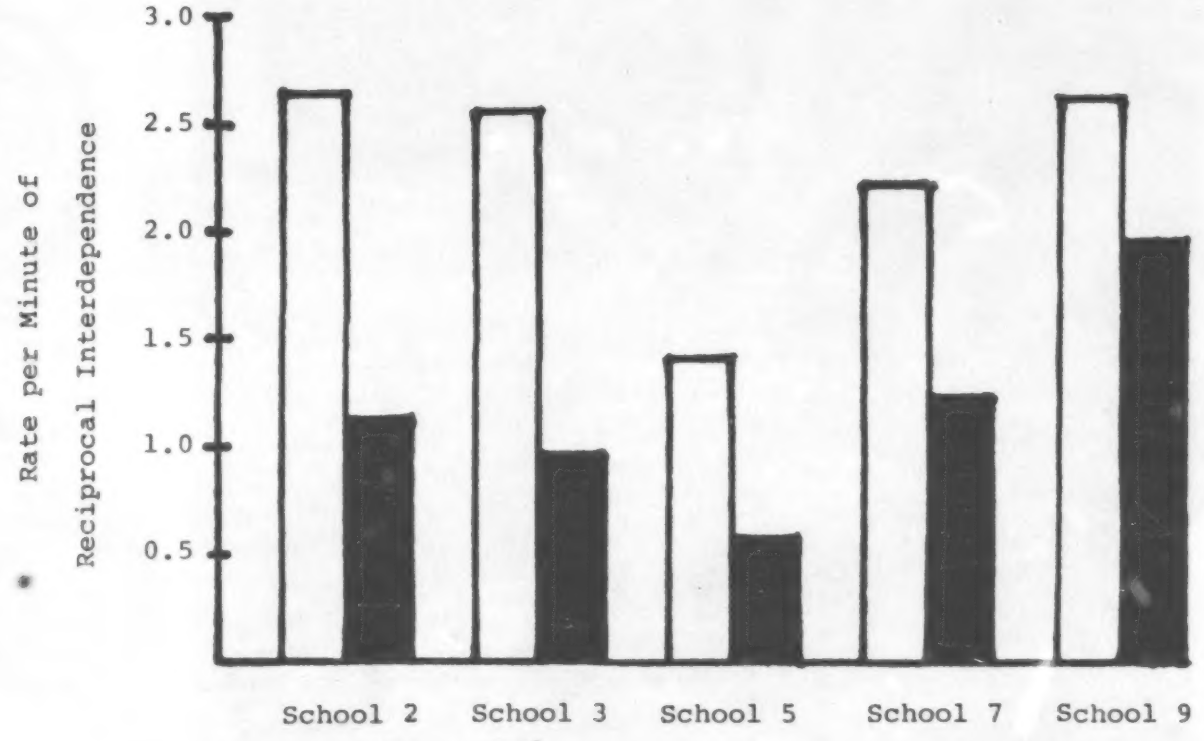

FIGURE IV

Average Team Reciprocal Interdependence, RDM and Overall Implementation Score for Treated Teams